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PATENT ABSTRACTS OF JAPAN

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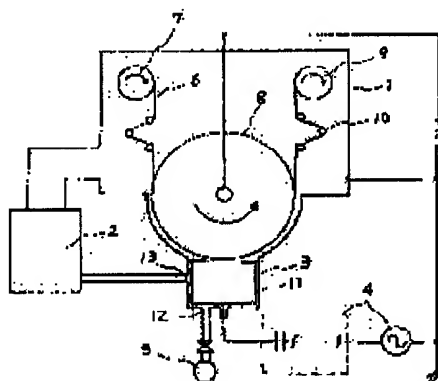
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(54) METHOD AND APPARATUS FOR FORMING CARBON FILM

(57)Abstract:

PURPOSE: To continuously and stably form a hard carbon film on the surface of a film-like substrate by making the area of a counter electrode larger than the area of the apt to be treated of a rotary electrode and flowing the ions of high energy to the surface to be treated.

CONSTITUTION: The rotary electrode 8 is used as an electrode on the ground side and a high-frequency voltage is impressed to the counter electrode 11 to hold the plasma of a gaseous mixture. The carbon film is thereby forming on the surface of the film-like substrate of the rotary electrode 8. The area of the counter electrode 11 in contact with the plasma is made substantially larger than the area of the part to be treated of the rotary electrode 8. The plasma potential is made higher than the potential on the surface of the part to be treated by such mechanism, by which the ions of high energy are admitted into the surface of the part to be treated. The hard carbon film is thus easily formed.



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Partial English Translation of
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Page 3, right lower column, line 19 to page 4, left upper column, line 20:

Fig. 3 shows an apparatus according to another embodiment in which a plurality of treatment chambers are arranged around a rotary drum in order to improve the treatment speed. With this type of the apparatus, it is also possible to form a multi-layered film by changing the treatment conditions and the kinds of reaction gases in the treatment chambers and it is further possible by changing the structure of one of the treatment chambers to carry out another treatment such as plasma-cleaning, etching, sputtering, or physical plating at the same time of forming a carbon film. In the case of applying a high voltage to rotary drum 8, it is not possible to obtain such multifunction as above. In other words, this multifunction is a subsidiary effect of the present invention in which rotary electrode 8 is grounded.

[Effect of the Invention]

According to the present invention as described above in detail, the plasma is maintained by grounding the rotary electrode and applying a high frequency voltage to the counter electrode, and thus it is possible to avoid the structural problem in the case of applying a high frequency voltage to the rotary electrode, avoid generation of undesirable discharge, and avoid the problem of insulation.

Furthermore, since the area of the counter electrode is made sufficiently larger than the area to be treated on the rotary electrode (grounded electrode), it becomes possible that ions of high energy flow onto the surface of the area to be treated and then a hard carbon film can be readily obtained.

The reference numerals in the drawings:

1 denotes a vacuum vessel; 2 denotes an evacuation mechanism; 3 denotes a plasma treatment chamber; 4 denotes a high frequency voltage supply system; 5 denotes

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a reaction gas source; 6 denotes a film; 7 denotes a sending roll; 8 denotes a rotary electrode; 9 denotes a receiving roll; 10 denotes a guide roll; 11 denotes a counter electrode; 12 denotes a gas inlet; 13 denotes a gas outlet; and 14 denotes small holes.

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